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APPENDIX.

I.

PRICES IN GREAT BRITAIN.

TABLE A.

PRICES PUBLISHED BY THE LONDON "ECONOMIST," S. BOURNE,
AND R. H. I. PALGRAVE.

The first use of index numbers to represent the changes of prices was made by the late Mr. Newmarch in a table published in the "Annual Commercial History and Review" of the London *Economist*. The table is intended to show the movement of prices, during a series of years, for twenty-two articles in the English wholesale markets. Taking the average price for 1845-50, in every case, as the standard, represented by one hundred, the ratio of the price on January 1 and July 1 of every year is compared with this, the result being, in fact, a percentage. The sum of these percentages for twenty-two articles is the index number for the year, as twenty-two hundred is the index number for 1845-50. Division by twenty-two reduces the series of index numbers to average percentages. The articles selected are as follows:—

Coffee, sugar, tea, tobacco, wheat, butcher's meat, Surat cotton, raw silk, flax and hemp, wool, indigo, oils, timber, tallow, leather, copper, iron, lead, tin, Pernambuco cotton, cotton yarn, cotton cloth.

While probably the best known of all tables, the figures of the *Economist* are open to serious objections: (1) As the editors announce, the table "does not, of course, present a full and accurate representation of the variations of prices, inasmuch as it cannot allow for the relative importance of the different articles." Wheat, for example, counts for no more than indigo. (2) The quotations on a given day do not show the state of prices for the year. (3) The articles selected are too few in number to insure a proper view of prices in general. (4) The commodities are injudiciously chosen. There are four articles of cotton, causing serious distortion in the years 1862-67, and a disproportionate number of so-called raw materials. The continuity of the *Economist* table since 1850 (inter-

rupted only for the years 1852, 1854-56) explains the importance ascribed to it.

In the *Journal of the Statistical Society* (June, 1879, pp. 413-417), Mr. Bourne corrected the figures of the *Economist* by using only one quotation of cotton goods instead of four (the average of the four) and by adding coal. His table contains the prices of only twenty articles, and ends with 1879, but, in other respects, is like that of the *Economist*.

Mr. Bourne also constructed a table from the prices of articles in the country of their production, using the average prices of the years 1872-77 as the basis for comparison. His figures are taken from "the average of the years' transactions shown in the *Statistical Abstracts for Foreign Countries and for Colonial Possessions*, issued from the Board of Trade," and run from 1860 to 1879, but for only seven articles,—wheat, cotton, wine, silk, rice, opium, and tea.

In order to get a comparison with some Indian prices, which date back only to 1865, Mr. R. H. Inglis Palgrave, in the Appendix to the *Third Report of the Royal Commission on Depression of Trade and Industry*, 1886, p. 330, rearranged the figures of the *Economist* by taking the prices of the years 1865-69, instead of the years 1845-50, as the basis for comparison.

Realizing the insufficiency of the method adopted in constructing the *Economist* table, Mr. Palgrave prepared another table, based on the prices of 1865-69, "in which allowance is made for the 'relative importance' of each of the articles selected, which are the same as those taken in the *Economist*." The relative importance of an article is reached by finding the relative proportions of the home trade in it (taking into account both quantities and values) to the total home trade in the twenty-two commodities. For example, in the year 1873, the home trade in cotton (raw) was £48,000,000, and in indigo £800,000, out of £306,450,000 for all the twenty-two articles. So cotton is assigned an importance of three hundred and forty-six, and indigo of only six, out of twenty-two hundred, the standard index number. Of course, both his tables are open to the same objections as that of the *Economist*, except in the matter of "relative importance."

	<i>Economist</i> Table.			Bourne's Table.		Palgrave's Tables.			
				Basis of 1872-77.		<i>Economist</i> on basis of 1865-69.		Preceding corrected for relative importance.	
	Index Numbers.	Reduced to Per cent.	Corrected by Bourne.	Home Prices.	World Prices.	Index Numbers.	Per cent.	Index Numbers.	Per cent.
1845-50	2200	100							
1851 Jan. 1	2293	104	103						
1853 July 1	2451	111	114						
1857 " "	2996	136	140						
1858 Jan. 1	2612	118	123						
1859 " "	2543	115	118						
1860 " "	2692	122	123	94					
1861 " "	2727	123	124	94	113				
1862 " "	2878	130	125	95	116				
1863 " "	3492	158	144	109	143				
1864 " "	3787	172	151	115	170				
1865 " "	3575	162	138	105	175				
1866 " "	3564	161	141	107	132			2366	108
1867 " "	3024	137	128	98	120	2200	100	2434	111
1868 " "	2682	122	122	93	116			2179	99
1869 " "	2666	121	118	90	111			2058	93
1870 " "	2689	122	119	91	111			1963	89
1871 " "	2590	118	118	90	105	1995	91	1975	90
1872 " "	2835	129	133 125	101	108	1981	90	2046	93
1873 " "	2947	134	142 132	108	107	2132	97	2197	100
1874 " "	2891	131	136 127	103	99	2237	102	2298	104
1875 " "	2778	126	130 124	99	94	2207	100	2378	108
1876 " "	2711	123	123	94	95	2098	95	2125	97
1877 " "	2723	124	126	96	97	2044	93	2186	99
1878 " "	2529	115	118	90		2064	94	2205	100
1879 " "	2202	100	106	80		1910	87	2081	95
1880 " "	2538	115				1676	76	1806	82
1881 " "	2376	108				1918	87	1967	89
1882 " "	2435	111				1782	81	2054	93
1883 " "	2342	107				1830	83	1908	87
1884 " "	2220	101				1755	80	1924	88
1884 Jan. 1	2221	101							
1885 " "	2170	98				1660	75	1750	80
1885 Jan. 1	2098	95							
1886 " "	2048	93				1562	70	1669	76
1886 Jan. 1	2023	92				1509	69		

TABLE B.

PRICES COMPILED BY W. S. JEVONS.

In 1863, Professor W. Stanley Jevons published a pamphlet entitled *A Serious Fall in the Value of Gold ascertained, and its Social Effects set forth*. This was followed in 1865 by a paper in the *Journal of the Statistical Society*, vol. xxviii., pp. 294-320, on "The Variation of Prices and the Value of the Currency since 1782"; and, in 1869, by a letter to the *Economist*, vol. xxvii., pp. 530-532, on "The Depreciation of Gold." The three papers are reprinted in his collected *Investigations in Currency and Finance* (London, 1884).

In his first pamphlet, Jevons collated from various sources, chiefly from the *Economist*, the prices of thirty-nine articles, namely :—

I., silver, tin, copper, lead, bar iron, pig iron, tin plates; II., palm oil, linsced oil, tallow, hides, leather, timber, logwood, indigo; III., cotton (three grades), wool, silk, flax, hemp; IV., wheat, barley, oats, rye, beans, peas; V., hay, clover, straw, beef, mutton, pork, butter; VI., sugar, spirits, tea, pepper.

These prices were reduced in the following manner. The average of the monthly prices during each year was calculated,—apparently, the arithmetical mean was taken, though this is not stated. From the yearly prices thus obtained, the simple arithmetical average price of each commodity for the six years, 1845–50, was first drawn; and, with this six years' average as a base, the average price of every commodity for every year from 1845 to 1862 was compared. The results were expressed in percentages, the average of every commodity for 1845–50 being expressed by one hundred. When, however, the percentages of the thirty-nine commodities were averaged for any one year, in order to secure the final indicator of the state of general prices for that year, Jevons calculated the geometrical mean of the percentages. Substantially the same method was followed in the paper of 1865 in the *Statistical Journal*; but, in this case, the final result was indicated only by a diagram, no tables being given of general prices. The method was again used in the *Economist* letter of 1869; and this time a table was given, indicating for selected years before 1847, and for all years between 1847 and 1869, the course of average prices of “about fifty of the chief articles of commerce,” which, however, are not further specified. As to the uses of the arithmetical or geometrical mean, see a note in this *Journal*, *ante*, pp. 83–86.

Column one gives Jevons's figures of general prices as calculated in the *Serious Fall*. Column two gives the figures of the *Economist* letter, in which the average for 1849 is taken as one hundred.

Years.	1. Average of 1845– 50 taken as 100.	2. Average of 1849 taken as 100.	Years.	1. Average of 1845– 50 taken as 100.	2. Average of 1849 taken as 100.
1789		133	1855	117.6	125
1799		202	1856	122.5	129
1809		245	1857	128.8	132
1819		175	1858	114.2	118
1829		124	1859	116.0	120
1839		144	1860	117.9	124
1845	104.4		1861	115.1	123
1846	105.4		1862	113.4	124
1847	110.8		1863		123
1848	94.1	122	1864		122
1849	89.6	106	1865		121
1850	92.1	100	1866		128
1851	92.4	101	1867		118
1852	93.8	103	1868		120
1853	111.3	101	1869		119
1854	120.7	116			
		130			

TABLE C.

PRICES COMPILED BY A. ELLIS.

In the London *Statist* of June 8, 1878, Mr. Arthur Ellis published a table of the prices of twenty-five articles, taking his quotations and quantities from the Board of Trade returns for imports. The prices of the year 1869 were taken as a standard for comparison; but the years compared are only 1859, 1873, 1876, and the first quarter of 1878. Mr. Ellis used certain index numbers to indicate the relative importance of commodities,—*e.g.*, cotton is rated at nineteen and indigo at one. The number 1000 multiplied by the index yields the standard for 1869, with which other years are compared. By this means, “the purchasing power of money can be arrived at in the various periods.”

Articles imported or produced.	Index Numbers.	RELATIVE COST IN				
		1859.	1869 Stan'd.	1873.	1876.	First Quarter 1878.
Animals, oxen	8	6,300	8,000	7,700	9,670	9,115
Animals, sheep	6	6,200	6,000	7,470	7,460	8,020
Butter	2	1,850	2,000	2,050	2,200	2,170
Cheese	1	810	1,000	950	880	1,110
Coffee	1	1,110	1,000	1,430	1,540	1,500
Wheat	15	13,270	15,000	18,750	15,030	17,655
Barley	3	2,630	3,000	3,100	2,200	3,230
Maize	2	1,990	2,000	2,050	1,900	2,000
Flour	4	4,110	4,000	5,370	4,570	5,200
Spirits	1	1,020	1,000	1,230	1,020	1,005
Sugar	4	4,230	4,000	3,900	3,410	3,640
Tea	3	3,120	3,000	2,840	2,840	2,635
Tobacco	1	910	1,000	910	1,000	945
Wine	2	2,230	2,000	2,480	2,290	2,325
Cotton	19	11,520	19,000	14,660	11,010	10,540
Indigo	1	820	1,000	760	650	655
Flax	3	2,930	3,000	2,650	2,660	3,130
Hides	1	1,070	1,000	1,190	1,240	910
Coal	8	7,720	8,000	17,430	9,060	8,065
Copper	1	1,530	1,000	1,250	1,140	1,010
Iron, raw	2	1,980	2,000	4,300	2,160	1,855
Silk	2	1,670	2,000	1,720	1,570	1,475
Tallow	1	1,220	1,000	900	940	880
Wood	2	2,240	2,000	2,480	2,190	2,160
Wool	7	9,090	7,000	7,490	7,980	7,245
	100	91,570	100,000	115,060	96,610	98,475

TABLE D.

PRICES COMPILED BY MR. GIFFEN.

In a Report to the English Board of Trade in 1885 on the Prices of Imports and Exports from 1861 to 1877, Mr. Robert Giffen presented a table of prices for exports in the period from 1840 to 1883, and for imports from 1854 to 1883. The table includes thirty-five articles, with index numbers in which the relative importance of the articles is expressed. "To get the 'index number,' my plan has been to ascertain the percentage proportions of the value of the exports of each enumerated article to the value of the whole export trade, in alternate years since 1861." (*Journal of Statistical Society*, 1879, pp. 66-68, 305-321.) Having ascertained the proportion of the value of the exports of each article to the whole export trade, he adds together the numbers thus obtained for the thirty-five articles. In this way, he obtains an initial index number, which he fixes upon as 65.8 for exports. In a similar way, he settles upon 81.16 for imports. "An index number being thus formed, an average rise or fall may be shown by calculating the percentage of the rise or fall of each article on the portion of the index number assigned to it, the differences between the percentages of increase or decrease constituting an addition to or a reduction from the index number, which immediately shows whether there has been an average rise or fall and how much." See also *Contemporary Review*, June, 1885, p. 812, for later figures. In the appendix to the *Third Report of the Royal Commission on the Depression of Trade and Industry*, p. 329, Mr. Palgrave gives Mr. Giffen's figures, rearranging them on a basis of one hundred, starting with 1840 for exports and with 1854 for imports, as follows:—

Year.	Exports. Base line of 1840.	Per Cent.	Exports. Base line of 1854.	Per Cent.	Imports. Base line of 1854.	Per Cent.
1840	79.14	100				
1841	76.75	97				
1845	71.85	91				
1848	63.37	80				
1849	60.51	76				
1852	59.33	75				
1853	64.66	82				
1854	64.85	82	64.85	100	80.36	100
1855	63.05	80	63.05	97	84.67	105
1857	66.57	84	66.57	103	88.24	110
1859	66.20	83	66.20	102	79.77	99
1865	89.26	112	89.26	137	94.75	118
1868	77.22	97	77.22	119	86.89	108
1873	85.73	108	85.73	132	85.59	107
1875	74.47	94	74.47	114	81.41	101
1876	68.05	86	68.05	105	77.55	96
1877	65.40	82	65.40	101	79.68	99
1878	.....	...	.....	...	74.12	92
1879	59.70	75	59.70	92	70.86	88
1880	.....	...	.....	...	74.77	93
1881	59.54	75	59.54	92	74.17	92
1883	59.85	76	59.85	92	71.73	89

TABLE E.

PRICES OF LEADING WHOLESALE COMMODITIES IN JANUARY. PREPARED BY MR. GIFFEN, "JOURNAL OF STATISTICAL SOCIETY," 1879, P. 61, AND "CONTEMPORARY REVIEW," JUNE, 1885.

	Jan. 1873	1874	1875	1876	1877	1878	1879	1883	1885
Iron, Scotch pig, ton	127s	107s 6d.	80s	64s 3d.	57s 6d.	51s 6d.	43s	47s 8d.	41s 9d.
Coal, Hetton, }									
" Wallsend, }	30s	27s 6d.	30s	25s	19s	18s 6d.	19s	17s 6d.	18s
Copper, Chili bars, "	£91	£84	£83 10s	£82	£75 10s	£66	£57	£65	£48½
Tin, Straits, "	£142	£120	£94	£82	£75 10s	£66	£61	£93	£77½
Wheat, Gazette av. qr.	55s 11d.	62s 1d.	44s 8d.	45s 9d.	51s 6d.	51s 9d.	39s 7d.	40s 4d.	34s 11d.
" Red Spring, at									
New York, bu.	\$1.70	\$1.69	\$1.22	\$1.33	\$1.45	\$1.45	\$1.10	\$1.18	\$0.91
Flour, town made, sack	47s 6d.	53s 6d.	38s 6d.	42s 6d.	40s	46s	37s	38s	32s
" New York, bbl.	\$7.50	\$7.10	\$5.15	\$5.50	\$6.00	\$5.50	\$3.70	\$4.30	\$3.25
Beef, inferior, { by carcass	3s 10d.	3s 9d.	3s 8d.	4s 3d.	3s 3d.	2s 10d.	2s 10d.	4s 4d.	4s
" prime small, "	5s 3d.	5s 5d.	5s 5d.	5s 3d.	5s 2d.	5s	4s 9d.	6s	5s 4d.
Cotton, Mid Upland, lb.	10d.	8½d.	7½d.	7d.	6½d.	6½d.	5½d.	5½d.	6d.
Wool, pck.	£23	£19 15s	£18 5s	£17 10s	£16 10s	£15 10s	£13	£12	£11
Sugar, Manilla, }									
" Muscov., }	21s 6d.	18s	17s	15s	22s	14s 6d.	16s	16s 6d.	10s
Coffee, Ceylon, good, }									
" ordinary, }	80s	112s 6d.	84s	90s 6d.	87s 6d.	84s 9d.	65s	78s 6d.	71s
Pepper, blk. Malabar, lb.	7d.	8½d.	7d.	5½d.	5½d.	4½d.	4½d.	5½d.	8d.
Saltpetre, foreign, cwt.	29s	23s 9d.	22s 6d.	18s 6d.	20s	22s	19s	19s	15s 3d.

TABLE F.

PRICES COMPILED BY A. SAUERBECK.

In the *Journal of the Statistical Society* for September, 1886, Mr. Augustus Sauerbeck has presented a table of prices of thirty-eight articles for the period from 1846 to 1885, representing the average prices of the eleven years, 1867 to 1877, by one hundred. His index numbers are computed by taking the arithmetical mean of the quotations. "With but few exceptions," he says, "the prices given are the average prices in each year, either those officially returned or the averages of the twelve quotations at the end of each month, partly received from private firms, partly collected from the *Economist* and other publications. Where a range of prices is given, the mean has been taken between the highest and lowest quotations." The articles selected are as follows:—

I., wheat (two grades), flour, barley, oats, maize, potatoes, rice; II., beef (two grades), mutton (two grades), pork, bacon, butter; III., sugar (two grades), coffee, tea; IV., pig iron, bar iron, copper, tin, lead, coals (two grades); V., cotton (two grades), flax, hemp, jute, wool (two grades), silk; VI., hides, leather, tallow, palm oil, olive oil, linseed oil, petroleum (since 1872), soda crystals, nitrate of soda, indigo, timber.

(1) It is to be regretted that all the prices are not averages. (2) The relative importance of articles, also, is insufficiently represented; *e.g.*, olive oil has as great an influence on the index number as iron. (3) No satisfactory statement is made as to the sources from which he gets his quotations. (4) He admits that "it was impossible to retain exactly the same standard for this long period [1846 to 1885], owing to the frequent alterations of descriptions; and the old quotations for a few articles, such as sugar, coffee, and flax, must be considered as only approximately showing the course of prices." (5) The commodities are almost entirely raw produce. So that in sources of information, reliability, numbers of articles, and continuity of quotations on the same system, the most considerable collection of English prices falls behind the Hamburg table.

Year.	Vegetable Food (Corn, &c.)	Animal Food (Meat, &c.)	Sugar, Coffee, and Tea.	Total Food.	Minerals.	Textiles.	Sundry Materials.	Materials.	Grand Total.
1846	106	81	98	95	92	77	86	85	89
1847	129	88	87	105	94	78	86	86	95
1848	92	83	69	84	78	64	77	73	78
1849	79	71	77	76	77	67	75	73	74
1850	74	67	87	75	77	78	80	78	77
1851	73	68	81	74	75	75	79	76	75
1852	80	69	75	75	80	78	84	81	78
1853	100	82	87	91	105	87	101	97	95
1854	123	87	85	101	115	88	109	104	102
1855	129	87	89	101	109	84	109	101	101
1856	109	88	97	99	110	89	109	102	101
1857	105	89	119	102	108	92	119	107	105
1858	87	83	97	88	96	84	102	94	91
1859	85	85	102	89	98	88	107	98	94
1860	99	91	107	98	97	90	111	100	99
1861	102	91	96	97	91	92	109	99	98
1862	98	86	98	94	91	123	106	107	101
1863	87	85	99	89	93	149	191	115	103
1864	79	89	106	88	96	162	98	119	105
1865	84	97	97	91	91	134	97	108	101
1866	95	96	94	95	91	130	99	107	102
1867	115	89	94	101	87	110	100	100	100
1868	113	88	96	100	85	106	102	99	99
1869	91	96	98	94	89	109	100	100	98
1870	83	98	95	93	89	106	99	99	96
1871	94	100	100	98	93	103	105	101	100
1872	101	101	104	102	127	114	108	115	109
1873	106	109	106	107	141	103	106	114	111
1874	105	103	105	104	116	92	96	100	102
1875	93	108	100	100	101	88	92	93	96
1876	92	108	98	99	90	85	95	91	95
1877	100	101	103	101	84	85	94	89	94
1878	95	101	99	96	74	78	88	81	87
1879	87	94	87	90	73	74	85	78	83
1880	89	101	88	94	79	81	89	84	88
1881	84	101	84	91	77	77	86	80	85
1882	84	104	76	89	79	73	85	80	84
1883	82	103	77	89	76	70	84	77	82
1884	71	97	63	79	68	68	81	73	76
1885	68	88	63	74	66	65	76	70	72